Overview of Central H2A Results

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Definition of Central

- Central is defined as H2 production of >50,000 kg/day
- Production costs include compression to 300 psi
- H2 purity – suitable for PEM fuel cells
- Minimal storage – for operational support purposes only

Central Technologies

	Coal Gasification	Coal Gasification w/CO2 Sequestration	Coal Gasif w/CO2 Seq & Power Co-production	Biomass Gasification
Current	Conventional	Conventional	Conventional	Distinct
Mid term		+Membrane Separation	+Membrane Separation	Advanced Distinct
Long term		+Adv Materials	+Adv Separation	Integrated

	Natural Gas Reforming	Nat Gas Reforming w/CO2 Sequestration	Current Nuclear Electrolysis	Advanced Nuclear
Current	Conventional	Conventional		
Mid term		+ Autothermal OTM	High Pressure	
Long term		+Advanced Separation		S-I Thermo-chemical
				Steam Electrolysis

		Stand-alone Wind Electrolysis	Wind Electrolysis w Power Co-production	
Current		Atmospheric	Atmospheric	**Note: Shaded Results Are Presented**
Mid term		High Pressure	High Pressure	
Long term		High Pressure	High Pressure	

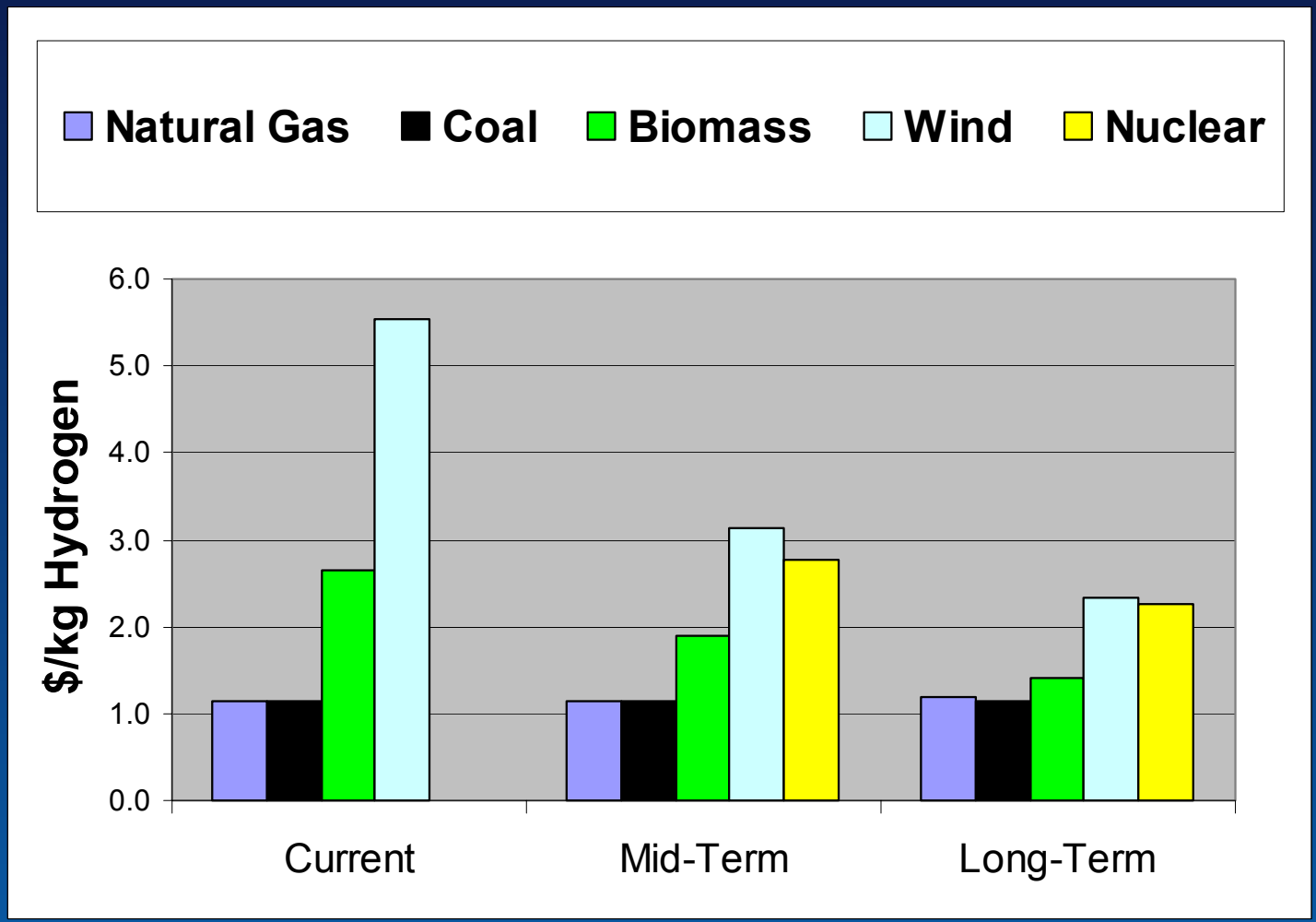
Central Capacities (1,000 kg/day)

	Coal Gasification	Coal Gasification w/CO2 Sequestration	Coal Gasif w/CO2 Seq & Power Co-production	Biomass Gasification
Current	285	285	285	75
Mid term		315	315	75
Long term		315	315	75

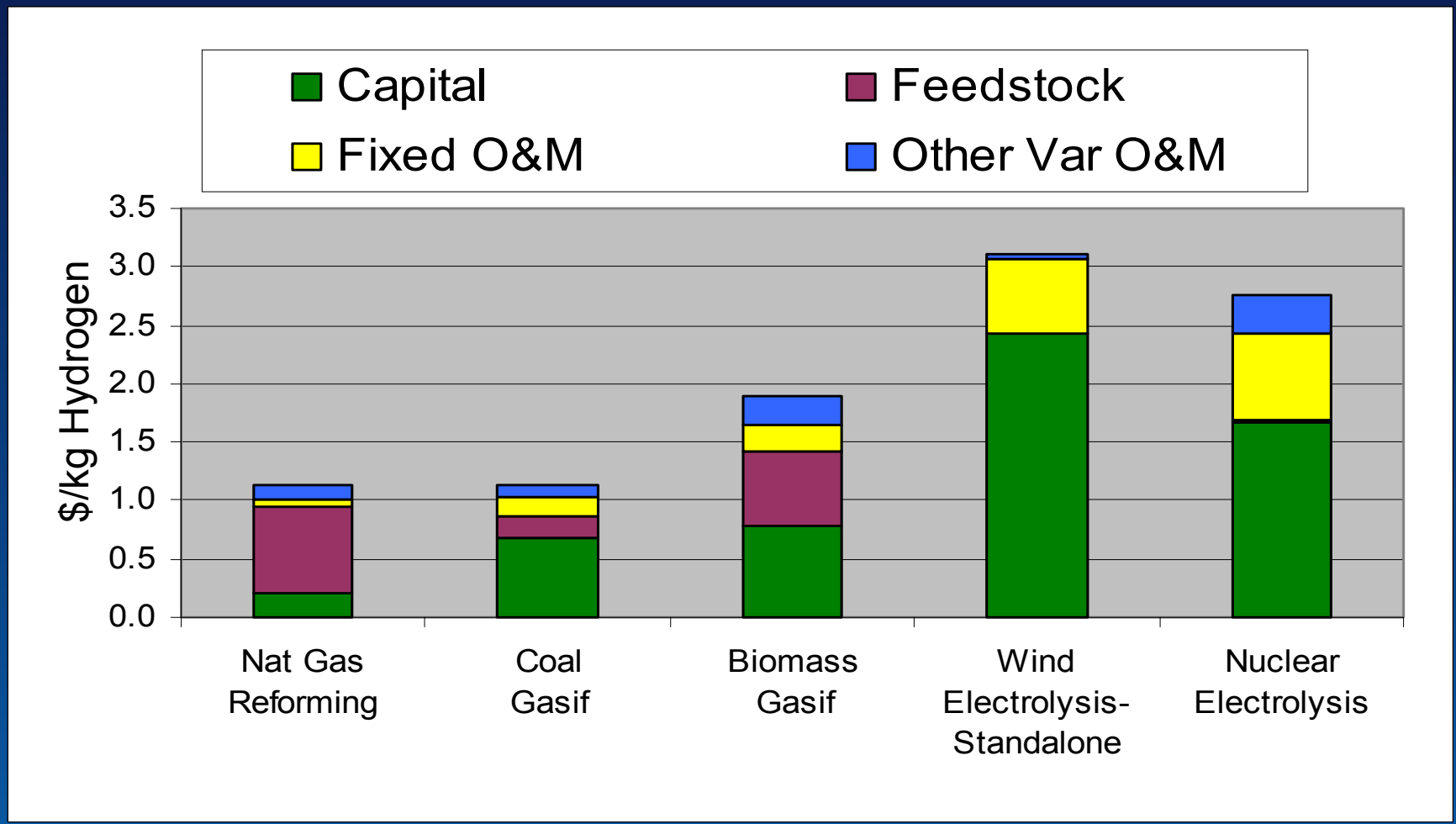
	Natural Gas Reforming	Nat Gas Reforming w/CO_2 Sequestration	Current Nuclear Electrolysis	Advanced Nuclear
Current	380	380		
Mid term		380	675	
Long term		380		770
				720

		Stand-alone Wind Electrolysis	Wind Electrolysis w Power Co-production	Note: Shaded Results Are Presented
Current		50	50	
Mid term		50	50	
Long term		50	50	

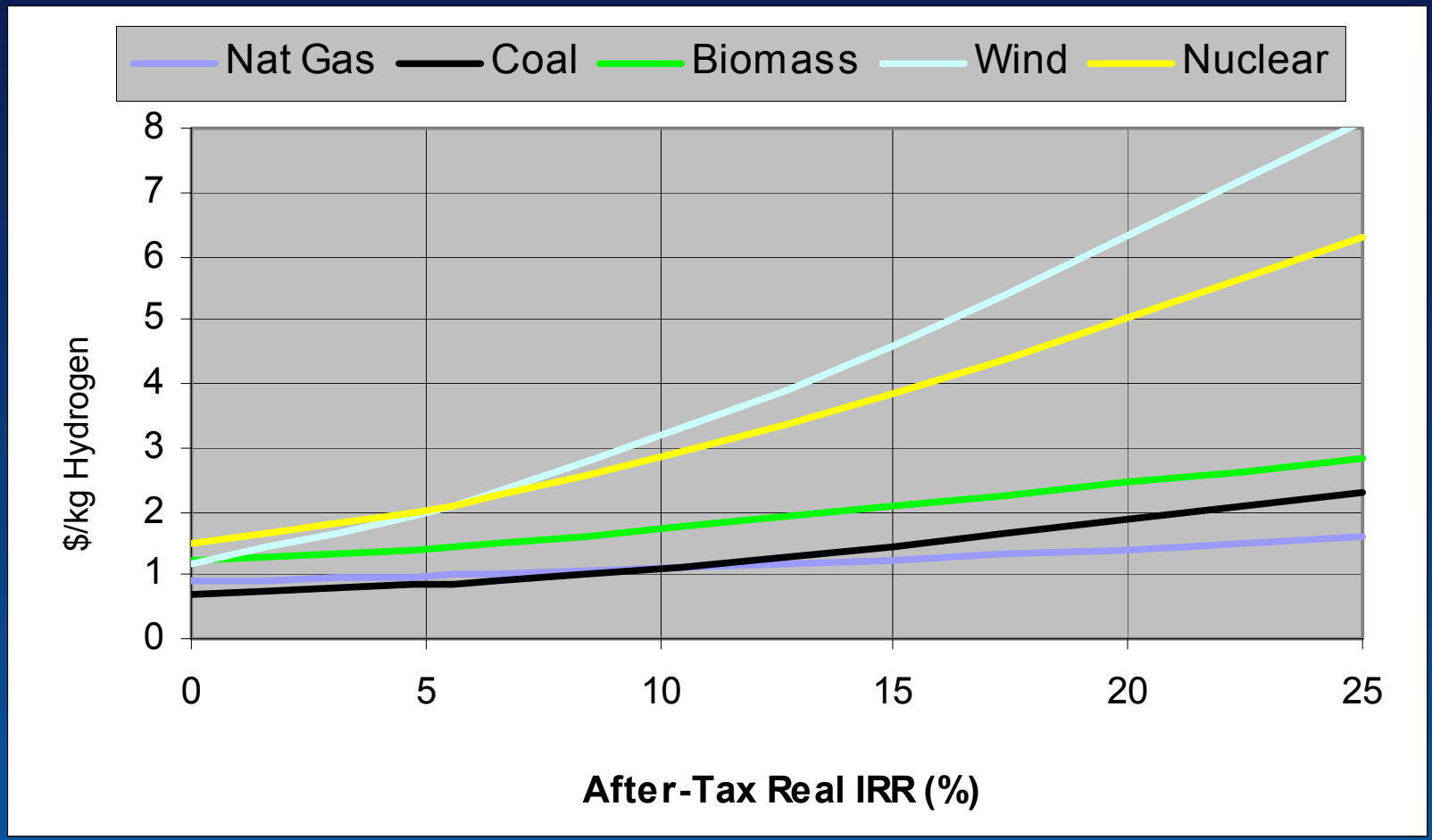
Central Technology Options
- $/kg Comparisons -



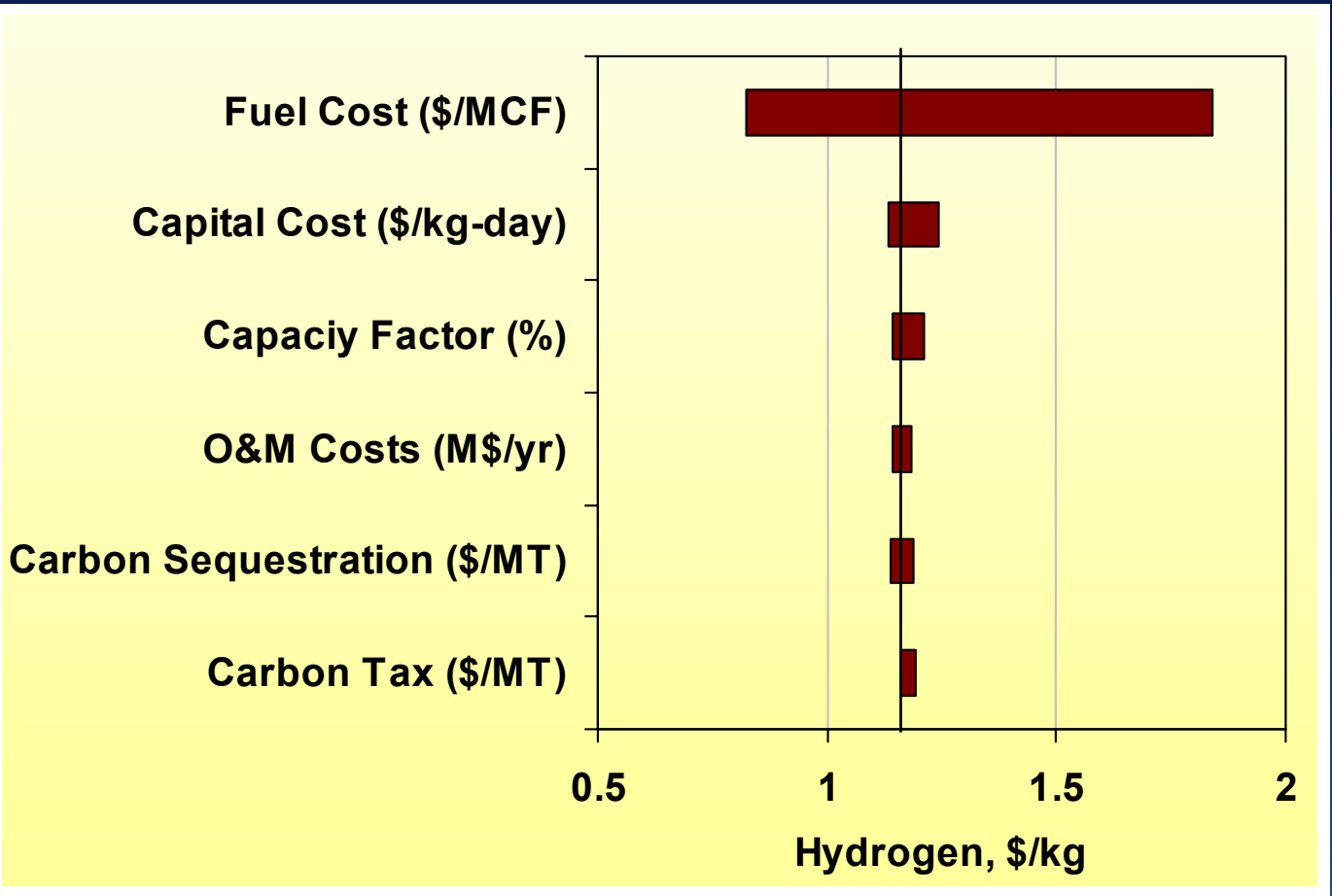
Mid Term Central Technology Options
- $/kg Components -



IRR Sensitivities for Mid Term Central Options



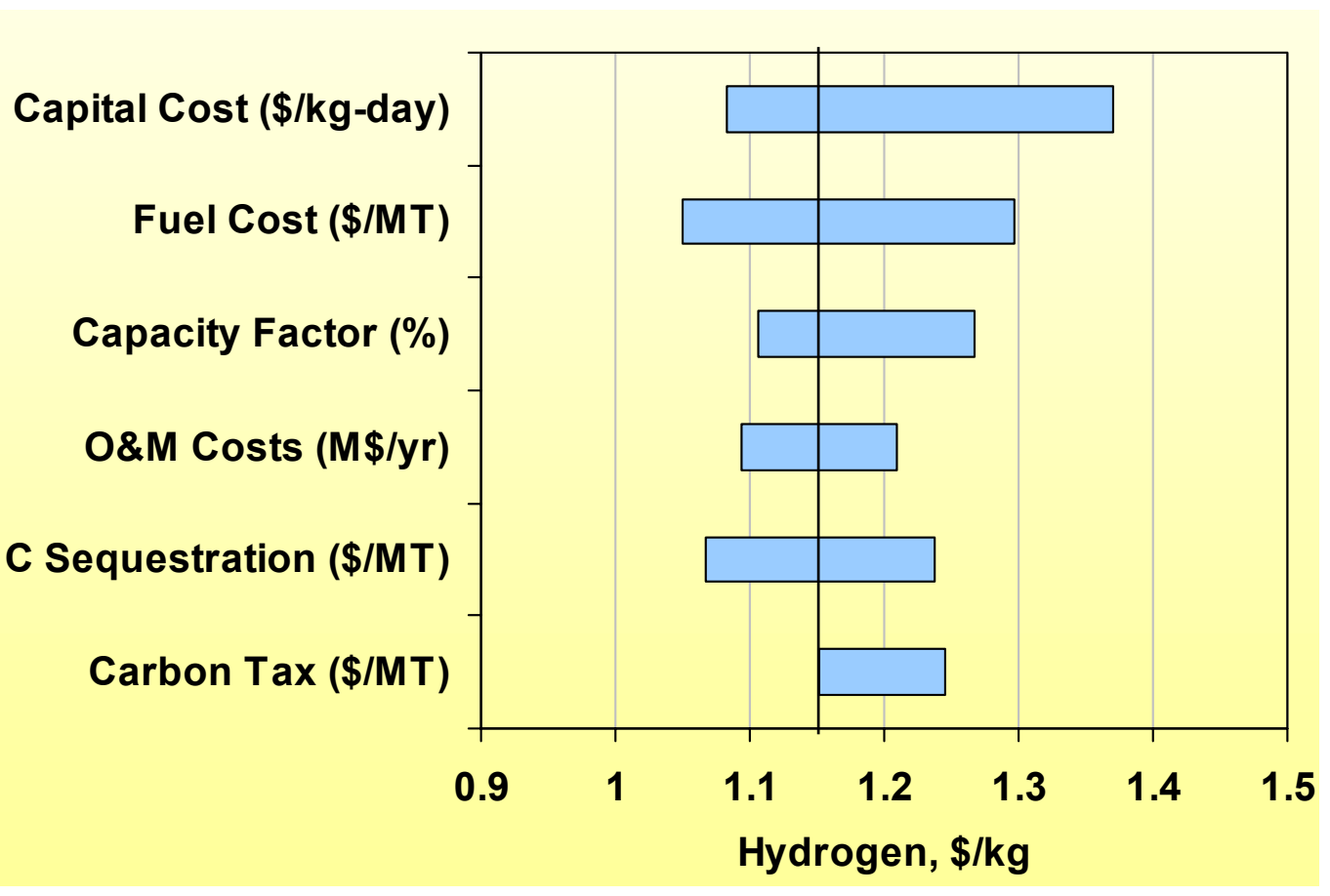
Sensitivity Results: Natural Gas Reforming - 2015



Low	Base	High
-50%	4.5	+100%
-10%	475	+30%
95%	90%	80%
-30%	7.6	+30%
0	15	30
0	0	150

Base Case $1.16kg

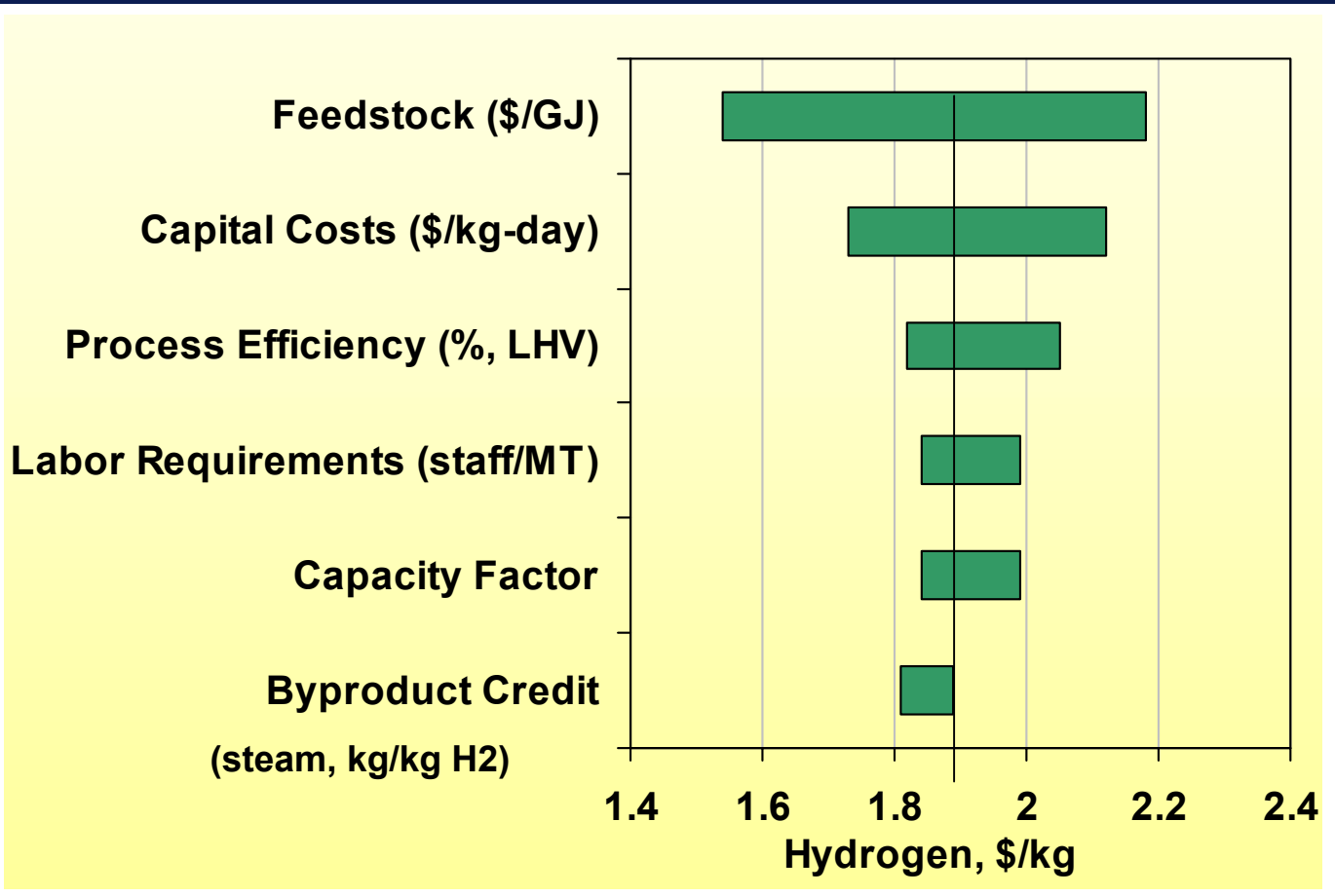
Sensitivity Results: H_2 From Coal Gasification - 2015



Low	Base	High
-10%	1315	+30%
-40%	25	+60%
95%	90%	80%
-30%	16.6	+30%
0	15	30
0	0	150

Base Case
$1.15/kg

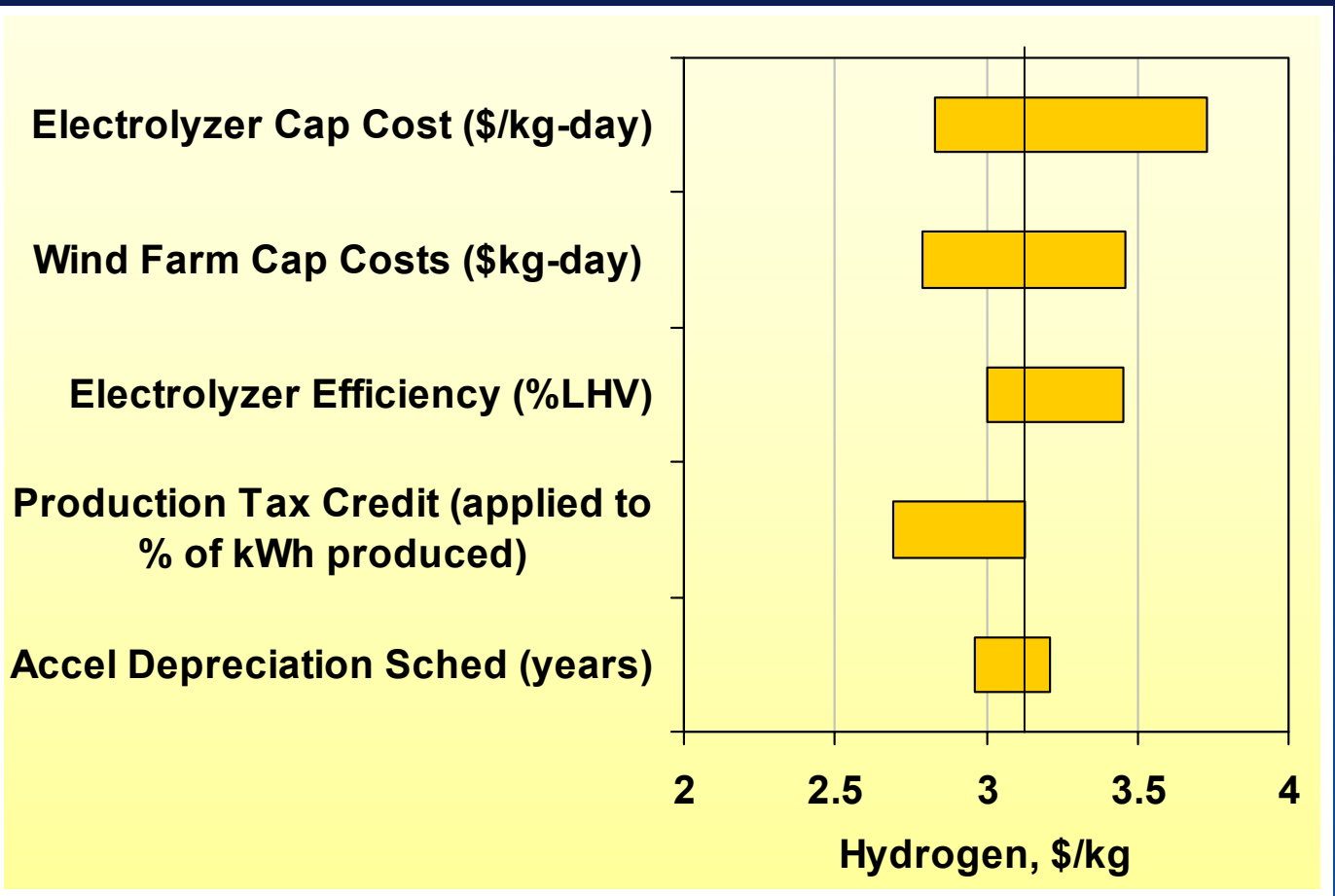
Sensitivity Results: H_2 From Biomass Gasif - 2015



Low	Base	High
1.2	2.5	3.6
-20%	1,500	30%
50%	45%	36%
0.24	0.30	0.54
95%	90%	80%
4.6	0	0

Base Case
$1.90/kg

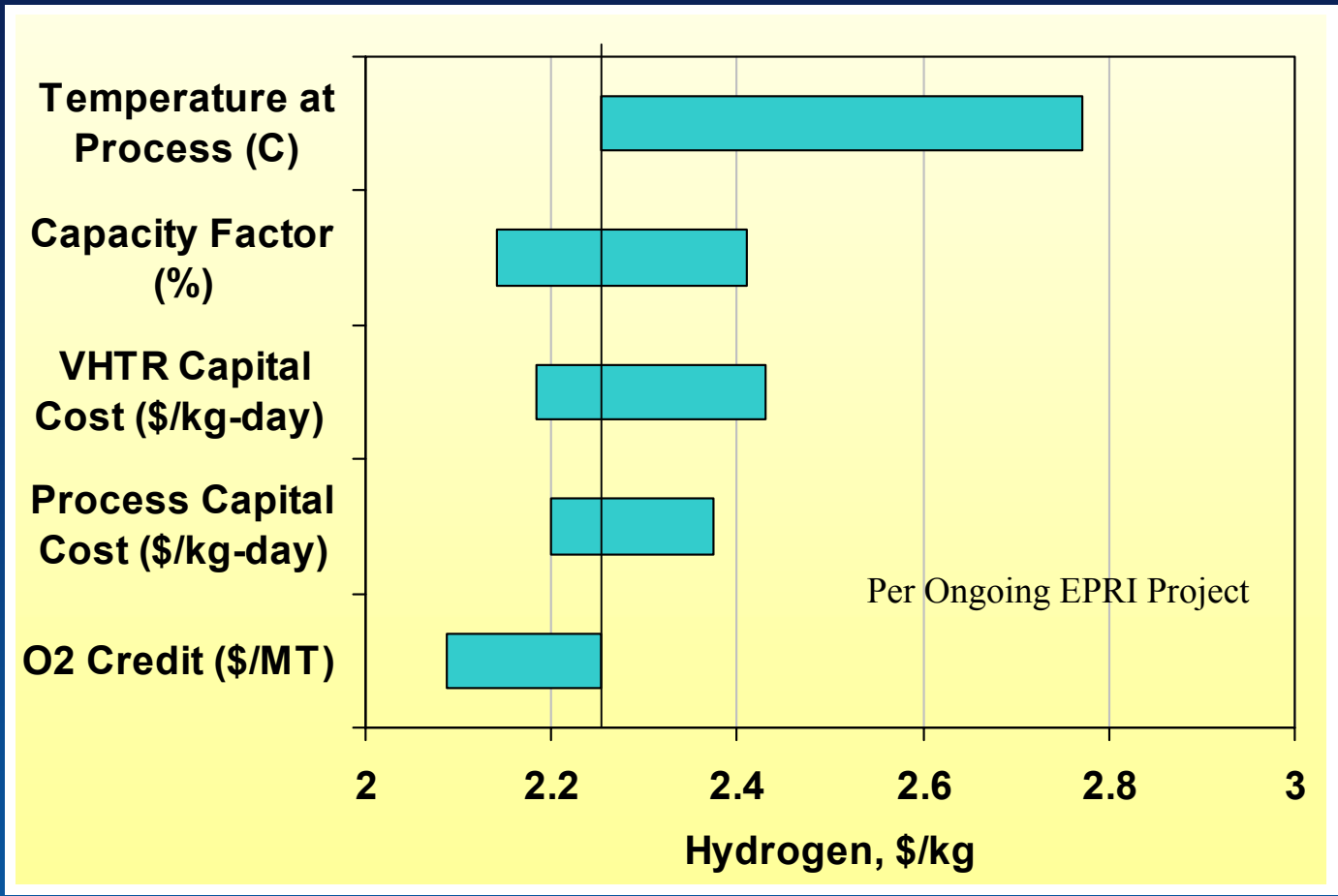
Sensitivity Results: H_2 From Wind Electrolysis - 2015



Low	Base	High
-25%	1935	50%
-20%	3065	20%
74%	71%	64%
100%	0%	0%
10	15	20

Base Case
$3.13/kg

Sensitivity Results: H_2 From Advanced Nuclear (VHTR) & Sulfur-Iodine Thermo-chemical Process - 2030



Low	Base	High
900	900	825
95%	90%	80%
-10%	1220	25%
-10%	865	25%
20$/MT	0	O

Base Case $2.25/kg

Next Steps

- Incorporate emissions calculations and results (Summer ‘04)
- Website with spreadsheet tool, results, and detailed documentation (Summer ‘04)
- Peer-reviewed paper (Fall ‘04)